University of Houston-Downtown

Course Prefix, Number, and Title: MATH 1301: College Algebra

Credits/Lecture/Lab Hours: 3/3/0

Foundational Component Area: Mathematics

Prerequisites: **Prerequisites:** A grade of C or better in MATH 1300 or a TSI score of 350 or higher.
Co-requisites: None

Course Description: College-level topics in algebra including variation, systems of equations, nonlinear inequalities, functions and their graphs, lines, quadratic equations and functions, complex numbers, polynomials, exponential and logarithmic functions, the algebra of functions, and applications related to these topics.

TCCNS Number: MATH1314

Demonstration of Core Objectives within the Course:

Assigned Core Objective	Learning Outcome Students will be able to:	Instructional strategy or content used to achieve the outcome*	Method by which students' mastery of this outcome will be evaluated
Critical Thinking Communication Empirical & Quantitative Reasoning	Describe and communicate mathematical information verbally, numerically, graphically, and symbolically.	**Content:** Functions and their representations; types of functions and their rates of change; percent change; linear functions and models; absolute values; quadratic functions, power functions, exponential and logarithmic functions. **Instructional Strategies:** Asking students to convert different representations of functions into each other, find slope, x-intercept, y-intercept, vertex, power laws, simplify and evaluate symbolic expressions, graph functions, solve equations.	Final Exam and Online Homework which include: 1. Open-ended discussion questions where students have to discuss mathematical information or data; 2. Questions requiring students to create, analyze and interpret graphs and charts; 3. Peer-to-peer activity, where students should explain to each

			other orally their solution to a mathematical problem and/or concepts from a particular topic in mathematics.
Critical Thinking Empirical & Quantitative Reasoning	Use appropriate mathematical techniques to model situations from a variety of settings, including real-world applications in generalized mathematical forms.	**Content:** Linear, quadratic, piecewise, and power functions and models; midpoint formula; percent change; problem solving in applications. **Instructional Strategy:** Asking students to extrapolate and interpolate data, convert data given by graphs and tables into equations, interpret and classify real-world data sets.	Final Exam and Online Homework.
Critical Thinking Empirical & Quantitative Reasoning	Interpret mathematical models, such as formulas, graphs, tables, and schematics, and draw inferences from them.	**Content:** Interpret parameters of linear, quadratic, piecewise, power, exponential and logarithmic functions occurring in applications, determine characteristics of model behavior using the properties of functions and their graphs (slopes, intercepts, local extrema, etc.). **Instructional Strategies:** Online homework questions asking students to convert formulas, graphs and tables into qualitative descriptions.	Final Exam and Online Homework.
Critical Thinking Empirical & Quantitative Reasoning	Discern relationships and patterns in quantitative data to arrive at informed conclusions.	**Content:** Fit given data to linear, quadratic, piecewise, power, exponential and logarithmic functions, extrapolate and interpolate based on the fit, construct simple models based on	Final Exam and Online Homework.

		informal descriptions. **Instructional Strategies:** Asking students to translate text descriptions of applied problems and quantitative data into tables, graphic and analytic representations, use these representations to optimize parameters, predict behavior or fill in missing data.	
Critical Thinking Empirical & Quantitative Reasoning	Utilize appropriate technology to enhance mathematical thinking and understanding, to solve mathematical problems, and to judge the reasonableness of the results.	**Content:** Nonlinear functions and equations: features of graphs, generalizing based on features of graphs (relationships between turning points, extrema and direction of increase); introduction to functions and graphs—choosing the appropriate viewing window; solving quadratic inequalities; solving optimization problems using a graph. **Instructional Strategy:** Asking students to analyze and answer questions about graphing calculator plots; choose the appropriate viewing window for a function; trace intercepts and extrema; use graph to solve quadratic inequalities.	Final Exam and Online Homework which include problems requiring students to use graphing utilities to find a solution.

Additional Course Outcomes:

- Interpret and use functional notation, express concepts and properties in functional notation, recognize and apply different types of functions including linear, polynomial, exponential and logarithmic.
- Determine key properties of functions from various representations, convert among the representations, and recognize common properties of different functions.
- Solve linear, quadratic and absolute value equations and inequalities, interpret solutions.

- Interpret numerical data and construct simple models, interpolate and extrapolate data, evaluate the meaning of results.
- Use graphing utilities to graph functions, solve equations, visualize and interpret data.
- Demonstrate mathematical reasoning skills and skills for presenting mathematical concepts and arguments.

Course Outline:

- **Unit I - Introduction to Functions and Graphs** (7 hours)
  - Review sets of numbers; visualization of data; relations, functions, and their representations; the Midpoint Formula; function notation and its practical interpretation; types of functions and their rates of change; interval notation; where a function is increasing and decreasing; percent change.
  - Optional: Setting the viewing window on a graphing calculator; making a scatter plot on the graphing calculator representing a function on a graphing calculator.
- **Unit II - Linear Functions and Equations** (7 hours)
  - Topics or techniques to be covered include: Linear functions and models; equations of lines; linear equations; intercepts and their practical interpretation; linear inequalities; piecewise-defined functions; absolute value equations; absolute value inequalities; direct variation;
  - Optional: Locating a zero of a function on a graphing calculator, applying the intersection of graphs method of solving equations (); solving equations with technology.
- **Unit III - Quadratic Functions and Equations** (7 hours)
  - Quadratic functions and models; quadratic equations and problem solving; quadratic inequalities; complex numbers. Solving equations with technology; solving quadratic inequalities with technology.
- **Unit IV - Nonlinear Functions and Equations** (7 hours)
  - Review all topics from prerequisite courses as needed; nonlinear functions and their graphs; polynomial functions and models; fundamental properties of polynomials; the Fundamental Theorem of Algebra. Discussion of rational functions and models as time permits. Discussion of inverse proportion (and polynomial and rational inequalities only as time permits).
  - Optional: Finding extrema on the graphing calculator.
- **Unit V - Exponential and Logarithmic Functions** (7 hours)
  - Combining functions with algebraic operations; decomposing functions; inverse functions and their representations; inverse function notation and its practical interpretation; exponential functions and models; logarithmic functions and models; properties of logarithms; exponential and logarithmic equations. Instructors are strongly encouraged to have students use calculators during this unit. Discuss constructing nonlinear models only as time permits.
  - Optional: Graphing an inverse function; solving an exponential equation graphically.

- **Unit VI - Systems of Equations and Inequalities** (3 hours)
    - Review or discuss functions and equations in two variables; systems of equations and inequalities in two variables as needed. Systems of linear equations in three variables.
- **Peer-Interview Activity** (1 hour)
    - Students will be paired up to participate in a peer-interview about a particular topic in mathematics. Choice of a topic and the specifics are left to the instructor.

Grading/Course Content which Demonstrates Student Achievement of Core Objectives:
The grading scale is as follows: 100-90% = A; 89-80% = B; 79-70% = C; 69-60% = D; 59-0% = F.

Summary of Course Exams, Quizzes, Assignments and Final	
Three in-class tests (15%/exam)	45% of final grade
Quizzes	15% of final grade
Homework and in-class activities including written and oral assignments.	7% of final grade
Final	33% of final grade
NOTE: If the final exam score is less than 50, the student will receive an "F" for the course regardless of his or her average.	